

### **REMARKS**

Claims 1, 3, 4, 6, 7, 9 and 11-18 are pending. Claims 1, 3, 4, 6, 7, 9 and 11-18 stand rejected. In view of the remarks below, Applicants respectfully request that the rejections be withdrawn and the claims be allowed.

In Applicants' response of August 17, 2007, Applicants presented amended independent claims 1, 4, 7, 9, 11, 15 and 17. Applicants respectfully note that the Office Action of November 14, 2007 fails to address all of the amendments made to these claims. In fact, when quoting the claims, the Office Action omits quotation of certain claim limitations that Applicants assert distinguish the present invention over the cited prior art, as explained in the response of August 17, 2007, and as further explained below. In addition, there are several instances where the Office Action addresses claim language that is not included in the claims. Applicants respectfully request that the Examiner reconsider the patentability of the pending claims based upon the language recited in the amended claims.

Claims 1, 3, 4, 6, 7 and 9 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent Application Publication No. 2002/0026540 to Smyers ("Smyers") in view of U.S. Patent No. 7,251,747 to Bean et al. ("Bean"). The rejection is respectfully traversed.

Claim 1 relates to a "method for processing a host command in a storage system including a plurality of storage elements coupled to a plurality of storage controllers." The method includes "receiving a host command directed to a volume of said storage system from a host," the host command received "at a first one of said plurality of storage controllers." A target storage controller is determined for the host command, and, "if said target storage controller is not said first one of said plurality of storage controllers, forwarding the host command to said target storage controller." The target storage controller executes the command and then forwards "to said first one of said plurality of storage controllers ... an execution status indicating completion of said host command" (emphasis added, highlighting a limitation added in the Amended filed on August 17, 2007, but not considered in the Office Action). The first one of said plurality of storage controllers

receives "said execution status" and forwards "said execution status to said host." As explained below, Smyers fails to disclose each element and limitation of claim 1.

Smyers discloses a system where a controller receives a record instruction and then sends the record instruction to a selected audio/video hard disk drive ("AVHDD"). Smyers, ¶¶ [0031], [0032]. Once an AVHDD is selected to record content and that AVHDD is ready to record, control of recording content is shifted to the selected AVHDD. Smyers, ¶ [0033]. "The recording AVHDD then begins recording the stream of data from the source [or host] device. If the recording AVHDD runs out of available storage space while the source device is still transmitting the stream of data, the recording AVHDD, will locate the next available AVHDD within the network and forward the record command to that AVHDD." *Id.* "Once the next available AVHDD begins recording the stream of data, it ... inform[s] the prior recording AVHDD that it is successfully recording the stream of data." Smyers, ¶ [0035].

Although Smyers discloses the sending of communications between prior and currently recording AVHDDs, nowhere does Smyers disclose that a specific AVHDD or controller forwards "an execution status indicating the completion of said host command" to either a prior recording AVHDD or to a host, as recited in claim 1. The forwarded recording status taught by Smyers does not indicate completion of the received command, but only initialization of the received command. "Once the next available AVHDD begins recording the stream of data, it ... inform[s] the prior recording AVHDD that it is successfully recording the stream of data." Smyers, ¶ [0035]. Furthermore, Smyers does not indicate which device, if any, in the controller/AVHDD system sends an execution status to a host indicating completion of the host command. Conceivably, either the Smyers controller or one of the AVHDDs could send an execution status, if it is sent at all. Claim 1, however, recites that the target storage controller forwards "to said first one of said plurality of storage controllers, an execution status indicating the completion of said host command," and that the "first one of said plurality of storage controllers," *i.e.*, the controller that received "a host command ... from a host," is the device that forwards to the host the execution status indicating completion of the host command.

Additionally, claim 1 recites that a copy of the received host command is stored at the first one of said plurality of storage controllers “until the host command has been executed and the execution of the host command has been reported to the host.” After the command is executed and the execution status is forwarded to the host, the first one of said plurality of storage controllers erases “the stored copy of the host command.” Smyers does not disclose the storage of a host command on a first receiving controller until the host command has been executed to completion.

For at least these reasons, Smyers fails to teach each limitation of claim 1.

Bean is directed to a method for “efficient and accurate re-starting of data transfers using volatile data transfer mechanisms, such as pipes, following an error.” Bean, Abstract. In Bean, a “fallback file” is used to save portions of transferred data. *Id.* The fallback file is overwritten or erased when the Bean module determines that a portion of the transferred data has been transferred correctly or that the transfer is complete. Bean, Abstract; col. 16, ll. 5-22. However, Bean fails to teach “storing the host command until the host command has been executed and the execution of the host command has been reported to the host,” as recited in claim 1. At most, Bean teaches the temporary storage of a back-up file until the backed-up data is fully transferred and stored. Once the backed-up data is transferred, the fallback file is erased. However, claim 1 recites that the data stored is a command, and that the command is stored until the command has been executed and the execution of the command has been reported. Bean does not teach the saving of the fallback file until the fallback file has been executed or used and until this use has been reported to the host. Bean just doesn’t apply. Furthermore, Bean fails to remedy the inadequacies of Smyers in that Bean fails to teach the forwarding of an execution status indicating the completion of a host command from a target storage controller to a first one of said plurality of storage controllers, and the forwarding of the execution status indicating completion of the host command from the first one of said plurality of storage controllers to the host. Thus, Bean also fails to teach each limitation of claim 1.

For at least these reasons, the combination of Smyers and Bean fails to render claim 1 unpatentable, and claim 1 is allowable over the cited combination. Claim 3, which depends from

claim 1, is also allowable over the cited combination for at least the same reasons that claim 1 is allowable.

Claim 4 also relates to a “method for processing a host command in a storage system including a plurality of storage elements coupled to a plurality of storage controllers.” In claim 4, “a first one of said plurality of storage controllers” receives a host command. The first one of said plurality of storage controllers stores “the host command until the host command has been executed and the execution of the host command has been reported to the host.” and determines “a plurality of target storage controllers” to send component commands to, “the component command for a particular one of said plurality of storage controllers corresponding to at least a portion of the host command and relating to the logical volume associated with the particular target controller.” Once each target storage controller executes its component command, the at least first one of said plurality of storage controllers receives an “execution status from each one of said plurality of target storage controllers,” the received execution statuses “indicating completion of said component command” (emphasis added). The first one of said plurality of storage controllers determines “an aggregate host command execution status from said received execution status” and forwards “said aggregate host command execution status to said host.” The stored host command is erased by the first one of said plurality of storage controllers. The combination of Smyers and Bean fail to disclose each of these elements and limitations.

Smyers does not disclose the “determining [of] an aggregate host command execution status from said received execution status,” as recited in claim 4. The Examiner asserts that “Smyers discloses forwarding a recording status associated with the recording command to the prior recording AVHDD in paragraph 34-35. The ‘prior recording AVHDD’ corresponds to the ‘selected AVHDD’ (‘first storage controller’ from the claim) that stops and forwards the recording command if its capacity is low.” Office Action, pp. 7, 8. However, Smyers teaches that “[o]nce the next available AVHDD begins recording the stream of data, it ... inform[s] the prior recording AVHDD that it is successfully recording the stream of data.” Smyers, ¶ [0035]. There is no indication in Smyers that the prior recording AVHDD aggregates the forwarded indication with any other recording indication and then itself forwards the aggregate to another AVHDD, as asserted in the

Office Action. Smyers teaches nothing about aggregating multiple execution statuses. Also, as discussed above, Smyers fails to disclose that the “first one of said plurality of storage controllers” forwards any type of execution status indicating completion of the host command to the host, regardless of whether the execution status is an aggregation of statuses or a status from a single target storage controller. The recording indication forwarded by Smyers indicates an initialization of recording, not a completion.

Furthermore, as indicated above, Smyers fails to disclose that the first one of said plurality of storage controllers stores the host command upon receipt of the host command, and then later erases the stored command after the aggregate host command execution status has been forwarded to the host.

Similarly, as explained above, Bean fails to remedy the inadequacies of Smyers. Bean does not teach “storing the host command until the host command has been executed and the execution of the host command has been reported to the host.” Bean also does not teach the forwarding of an execution status from a target storage controller to a first one of a plurality of storage controllers, and from the first one of a plurality of storage controllers to a host, wherein the execution status indicates the completion of the host command.

For at least these reasons, the combination of Smyers and Bean fail to render claim 4 unpatentable, and claim 4 is allowable over the cited combination. Claim 6, which depends from claim 4, is also allowable for at least the same reasons that claim 4 is allowable.

Claims 7 and 9 both relate to a storage system that includes a plurality of storage controllers. The “plurality of storage controllers further comprise means for processing a host command received on any host port targeted to” any one or more of a “plurality of storage elements, the host command being received and stored by a single storage controller of the plurality of storage controllers and an execution status indicating completion of the host command being reported to a host by the single storage controller even when the host command is executed by others of the

plurality of storage controllers” (emphasis added). Neither Smyers nor Bean disclose each of these elements and limitations of claims 7 and 9.

As explained above, Smyers does not disclose a single controller that receives and stores a host command and then reports the execution status indicating completion of the host command to the host. Smyers fails to disclose which, if any, device reports an execution status to the host. Smyers fails to disclose an execution status that indicates completion of the host command. And Smyers does not disclose the storing of a host command on a controller “even when the host command is executed by others of the plurality of storage controllers.” For at least these reasons, Smyers fails to render claims 7 and 9 unpatentable.

The Office Action states that “Smyers does not disclose expressly erasing the host command after its execution and the execution of the host command has been reported to the host.” Office Action, pp. 11, 14. The Office Action then asserts that Bean teaches this. However, Applicants note that this language is not recited in claims 7 and 9. Even if it were, as explained above, Bean fails to teach these limitations. Additionally, Bean also doesn’t remedy the inadequacies of Smyers, as also explained above.

Thus, because the cited combination fails to teach each element and limitation of claims 1, 3, 4, 6, 7 and 9, these claims are allowable over the combination of Smyers and Bean. Applicants respectfully request the rejection be withdrawn and the claims be allowed.

Claims 11-16 stand rejected under 35 U.S.C. § 103(a) as being obvious over Smyers in view of U.S. Patent Application Publication No. 2001/0002480 to Dekoning et al. (“Dekoning”) and further in view of Bean. The rejection is respectfully traversed.

Claims 11 and 15 relate to scalable storage controllers that include a plurality of modules. Each module includes a processing element. Claim 11 recites that “the processing element of each of said modules is configured to search mappings between storage volumes and storage devices and to receive and store a host command and report the execution status of the host command to a host even when the host command is executed by others of the plurality of modules,

the execution status indicating completion of the host command.” Claim 15 recites that “the processing element of each of said modules is configured to process a host command for accessing a virtual volume by causing each module associated with said virtual volume to access its respective storage device, to search mappings between virtual volumes and logical volumes and to store the host command and report the execution status of the host command to a host even when the host command is executed by others of the plurality of modules, the execution status indicating completion of the host command” (emphasis added). Neither Smyers, Dekoning, nor Bean, either individually or combined, teach or suggest at least these elements and limitations of claims 11 and 15.

As discussed above, Smyers fails to teach or suggest a module with a processing element configured “to receive and store a host command and report the execution status of the host command to a host even when the host command is executed by others of the plurality of modules, the execution status indicating completion of the host command.” Smyers does not teach that the receiving module report the execution status of the host command to a host, wherein the execution status indicates completion of the host command. Additionally, as admitted in the Office Action, Smyers does not teach that each module include a cache memory. Office Action, pp. 16, 20. Furthermore, the Office Action asserts that Smyers teaches “the host command being received, stored and reported via execution status to a host by a single storage controller of the plurality of storage controllers even when the host command is executed by others of the plurality of storage controllers.” Office Action, pp. 16, 19. Applicants note that this language is not recited by claim 11. Claim 15 only recites portions of the quoted language. Therefore, even if Smyers did teach the quoted language, it is not relevant to these claims. For at least these reasons, Smyers does not teach or suggest each of the elements and limitations of claims 11 and 15.

Dekoning also fails to remedy the inadequacies of Smyers. Dekoning is relied upon to show the existence of a cache memory in each module connected to a primary interconnect. Office Action, pp. 16, 20. However, Applicants respectfully disagree that Dekoning shows the existence of a cache memory within each module. Figure 4 of Dekoning, referenced in the Office Action, shows a cache memory in two specific caching controller devices. However, a cache memory is not shown

within the multiple data storage element controllers. In fact, the Dekoning invention has no need “for duplicative local cache memory on each of the plurality of storage controllers” because of the existence of one or more central caching controllers. Dekoning, Abstract. In other words, Dekoning does not teach, but instead teaches away from the inclusion of a cache memory in each module of the scalable storage controllers recited by claims 11 and 15.

Furthermore, for the same reasons, Dekoning does not teach that each module includes a processing element configured to “store the host command and report the execution status of the host command to a host even when the host command is executed by others of the plurality of modules, the execution status indicating completion of the host command.” In Dekoning, only the caching controller stores the host command, not the data storage element controllers. Additionally, Dekoning fails to remedy the inadequacies of Smyers relating to the reporting of an execution status, wherein the status indicates a completion of the host command.

The Office Action relies upon Bean because “Smyers and Dekoning et al. do not disclose expressly erasing the host command after its execution and the execution of the host command has been reported to the host.” Office Action, pp. 17, 20. However, claims 11 and 15 do not require the quoted language, and even if they did, Bean fails to teach this limitation, as explained above. Furthermore, as explained above, Bean fails to remedy any of the inadequacies of Smyers.

For at least these reasons, the combination of Smyers, Dekoning and Bean fails to render claims 11 and 15 unpatentable. Claims 11 and 15 are allowable. Claims 12-14 depend from claim 11, and are thus allowable for at least the same reasons claim 11 is allowable. Claim 16 depends from claim 15 and is allowable for at least the same reasons that claim 15 is allowable. Applicants respectfully request the rejection be withdrawn and the claims allowed.

Claims 17 and 18 stand rejected under 35 U.S.C. § 103(a) as being obvious over Smyers in view of U.S. Patent No. 6,850,938 to Sadjadi (“Sadjadi”) and further in view of Bean. The rejection is respectfully traversed.



Claim 17 relates to a method of conflict detection in “a storage controller comprising a plurality of modules each capable of receiving host commands.” The method includes “receiving, at a first module, a first access request, storing the first access request at the first module until the first access request has been completed, receiving, at a second module, a second access request, [and] storing the second access request at the second module until the second access request has been completed.” Once an access request is executed by either of the first or second modules, the executing module forwards “an execution status to a host that sent the access request, the execution status indicating the completion of the access request” (emphasis added). Neither Smyers nor Sadjadi teach or suggest each of the elements and limitations recited by claim 17.

As explained above, Smyers fails to teach or suggest a module that receives and stores an access request and also forwards an execution status to the requesting host. Sadjadi also fails to remedy the inadequacies of Smyers.

Sadjadi teaches a method of conflict detection and resolution, but still does not teach all of the elements and limitations recited in claim 17. Specifically, Sadjadi fails to teach or suggest that a receiving module stores an access request. Additionally, Sadjadi does not teach or suggest the forwarding of an execution status to the requesting host, the execution status indicating completion of the access request. For at least these reasons, Sadjadi fails to render claim 17 unpatentable.

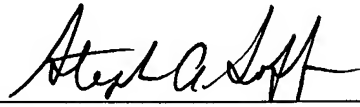
Bean, once again relied upon in the Office Action to teach a limitation that is not in claim 17 (*see* Office Action, p. 24), also fails to remedy the inadequacies of both Smyers and Sadjadi, as also explained above.

Because neither Smyers, Sadjadi nor Bean, individually or combined, teaches or suggests at least these elements and limitations of claim 17, claim 17 is allowable over the combination of Smyers and Sadjadi. Claim 18, which depends from claim 17, is also allowable for at least the same reasons claim 17 was allowable. Applicants respectfully request the rejection be withdrawn and the claims be allowed.

In view of the above amendment, Applicants believe the pending application is in condition for allowance.

Dated: April 14, 2008

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